This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

NEW COMMERCIAL PLANTS AND DRUGS.

No. 5.

PART I.—TANNING MATERIALS:

THEIR PREPARATION, PERCENTAGES, ETC.
WITH ILLUSTRATIONS.

PART II.—PLANTS AND DRUGS:

DESCRIPTION AND REPORTS ON THEIR SUCCESS, ETC.

BY THOS. CHRISTY, F.L.S.

LONDON:
PUBLISHED BY CHRISTY & CO.

1882.

Price One Shilling]

[*Entered at Stationers' Hall.*

SB
107
.C56

CONTENTS.

PAGE

PREFACE 3

METHOD OF DETECTING TANNIN 7

PREPARATION OF TANNING EXTRACTS 7

TANNING BARKS ... ... 9—18
Oak (9), Mimosa (10), Babool (17), Mangrove (17), Quebracho (18).

TANNING FRUITS ... ...19—26
Balsamocarpon (19), Divi Divi (21), Betel Nut (22), Pomegranate Rind (24), Myrobalans (25), Valonia (25).

GALLS—Oak, Chinese, and Tamarisk 27

SUMACH LEAVES 28

TANNING ROOTS ... ...29—35
Canaigre (29), Tormentilla (35), Marsh Rosemary (35).

TANNING EXTRACTS ... ...35—39
Hemlock, Chesnut, Oak Bark and Wood (35), Gambier (37), Kino (39), Hemlock and Chestnut (39).

TANNIN-YIELDING MATERIALS ... ...39—45
Percentages of various Materials (40), Table of Materials, and where they are used (43—45).

CHEMISTRY OF TANNINS... ... ...45—47

TANNIN TESTING APPARATUS ... ...47—52

CINCHONA CALISAYA 53

OMPHALOCARPUM FRUIT 54

COCA ERYTHROXYLON 55

CAROBA LEAVES... 57

PISTACIA GUM 58

PAPAW 59

CHINA SOY BEAN 62

EUPHORBIA PILULIFERA 64

THE SOUDAN VINE 67

LIST OF NEW I[illegible] 68

ADVERTISEMENT[illegible] 76

Gen. Lib.
Gift
Bryant Walker
10-23-16

PREFACE.

It is well known that the resources of many of our Colonies are not fully developed, because persons emigrating, as a rule, neither know how to recognise the value of the products they meet with, nor how to introduce them into commerce. At the same time there are merchants and manufacturers at home who could turn such products to account if they could only obtain them in sufficient quantity for experimental and afterwards for commercial purposes. My object in issuing the present Number of "New Commercial Plants" is to disseminate information, which may lead intending emigrants and colonists to investigate the properties of the plants they meet with, and to put them in the right way for placing such products in commerce. Almost every country on the globe possesses a variety of Tanning materials, and yet there is still an immense demand for any tanning substance, that would fulfil all the requirements of the tanner. Some of the plants yielding tannin would well repay cultivation, and I intend to call attention in this pamphlet more particularly to such as are already known and are the most likely to prove remunerative to planters, &c.

The trade of the tanner has by no means reached its full development as yet, indeed, comparatively little has been done abroad until quite recently to improve it. This is shown by the following facts that have recently come under my notice :—

On the Continent there is a firm of tanners which was accustomed to turn out 1,000 hides per week by an old-fashioned process, by which formerly it occupied three years to turn a raw hide into leather. This firm having heard wonderful reports of the value of "Extracts" prepared from tanning materials, purchased many tons without really understanding the properties of the articles urged upon them by dealers. Not being able to obtain a good result with these extracts, they complained to the vendors, who said "why don't you get an English tanner?" The firm then engaged an experienced English foreman, who, although he agreed to try and work up this large stock of extract, showed his employers that they could turn out better leather with certain proportions of pure extracts with six months as a maximum, than they had hitherto been in the habit of doing in three years. So they set to work, and the saving thus effected may be seen from the following account.

Now 1,000 hides are tanned every week, each hide costing £2. 10s. 0d. on an average, making an outlay of capital for the year of £130,000. It takes three years, according to the old plan, to convert the raw hide into good leather, at a cost of £390,000. By the new plan, the hide is tanned in six months, at an outlay of £60,000, thereby saving £330,000.

The features in this case are of equal importance to almost all tanners. It is absolutely necessary to purchase an Extract that is pure, and that can be relied upon. But the extracts which are to be met with in commerce at the present time are by no means as perfect as they might be. This appears to be due to the fact that tanning extracts are in the hands of a certain class of dealers who hold a monopoly of the article.

I shall be glad to assist any of the readers of this book by sending them out seeds of the plants or acorns of the different oaks, or by giving them any information or assistance in regard to the selection of suitable vessels for preparing the extracts in.

I beg of reviewers of this book to call the attention of readers to the fact that I will gladly examine and report upon any foreign substances which are thought to contain tanning matter. I would urge upon senders that they should be most careful to ascertain the quantity of the substances that is obtainable, and also the cost of collection, and that when they send me any product, they should state the weight in the green state, as well as in the dried, because this gives me some idea of the cost of production, and I am better able to decide whether the raw product should be turned into an extract, or whether the root or bark, &c. should be sent in its native form. It should be borne in mind that the taste of the different substances is not an absolutely reliable test, because there are many barks and vegetable substances which are intensely bitter as well as astringent. I think it will be to the advantage of merchants to try and establish their brands for the extracts, so that there may be always a guarantee for the quality, and first-class tanners will then buy them with confidence.

It is obvious that if tannin extracts can be prepared by colonists abroad, there will be an immense saving in freight in the cost of the raw material. I propose, therefore, in this number, to give some instructions which will enable persons, living abroad, to make and ship home the extracts, instead of the raw material.

In the first place, I shall describe the means of detecting the presence of tannin in any raw product, and then give an account of the different kinds of tannin, and their properties and peculiarities, and of the best modes of obtaining tanning extracts from the crude product.

In this work I have secured the assistance of Mr. W. N. Evans, whose thorough acquaintance with all that pertains to tanning is well-known; Prof. Bernardin, of Ghent, has also kindly helped me, and sent over valuable information.

In this book I allude to my success in having obtained an introduction through a City House to the largest Cinchona Planter in Bolivia, and owing to arrangements I have made, he is forwarding me supplies of seed freshly gathered from the trees. I have lately received the leaves and bark from the different trees, classified according to the names that they are known by in Bolivia, in the district. These have been recognised by Mr. Holmes.

I have now in the press a work upon Fibres, which will be fully illustrated by plates showing the sections of many of the important fibre-yielding plants. This book will also contain particulars of the new process discovered by Mr. C. D. Ekman, of Bergvik, Sweden, and his system will be explained, and the values of many of the products will be furnished, and the expense of producing them. The process will shortly be at work in Calicut, in India.

THOS. CHRISTY, F.L.S.

February, 1882.

NEW COMMERCIAL PLANTS & DRUGS.

No. V.

PART I.—TANNING MATERIALS.

METHOD OF DETECTING TANNIN.

The question would very naturally occur to any colonist or pioneer entering a new country—"How can I roughly detect the presence of tannin in any bark, root, or leaf of any tree or shrub I may meet with ?"

This can be done by simply boiling a portion of the bark, root, or leaf, and applying to the same a solution of Copperas, or Sulphate of Iron, which, boiled with the infusion of the leaf, will turn it to a black colour, in reality make it into *ink.* This, of course, shows the presence of gallic acid, but gallic acid is an after-product of tannic acid, and very often accompanies it in barks, &c. Everyone conversant with oak bark, with the harvesting of the same in England, will know that those who rip the bark from the boughs of the tree, mark their iron tools with black streaks, so that in the very use of the saw or axe, if the sap is flowing in the tree, its presence will be manifested by the black colour on the edge of the cut. To make still more certain of the presence of tannin, a solution of gelatine, or very thin glue, or isinglass in a warm state, may be poured into the decoction of bark, &c. ; if the bark contains tannin, a white-coloured precipitate will soon fall to the bottom of the glass containing the mixed solution.

THE PREPARATION OF TANNING EXTRACTS.

The *modus operandi,* as at present employed, is comparatively simple. The material is first ground to fine powder, then placed in vats 8 ft. square, and 4 ft. deep. These tanks, with a capacity of 1600 galls. should be filled three-parts full of the finely pulverised bark :

cold, or tepid water at about 90° F. is then poured on the bark, just sufficient to cover it. The mixture is allowed to remain for 24 hours, when the water will have dissolved a great portion of the tannic acid. This infusion is then pumped into another similar tank containing fresh material, so that every additional tank gives an increase of strength to the infusion. Presuming we had four tanks of this size, each of which would readily contain a ton of the material, the last liquor obtained should have a considerable specific gravity. This liquor is then run off into an evaporator. This evaporator, according to the most approved plans, is a semi-circular copper vessel, about 5 feet in diameter, 3 feet deep in the centre. This is enclosed in a larger vessel of iron, which may be placed over a fire, and thus gradually a great portion of the water passes off; or the tanning material may be placed in what is called a "jacketted" pan, the inner pan being of copper, the outer of iron, the space between being filled with steam, which, in this manner, causes an evaporation of the water. But in India and other countries where this apparatus cannot be readily obtained, the evaporation of water from the liquid might be produced in large earthen pans kept over a slow fire, and constantly stirred. On no account must the liquor be made or evaporated in an iron vessel, as this would cause the extract to discolour the leather. The consistency to which the extract may be brought, is a matter of experience and judgment. Too great a heat will cause considerable destruction of the tannic acid, not only charring and burning it, but also causing a chemical change to take place, transforming the tannic acid into gallic acid, which is of little or no use in the tanning process. Most of the tanning materials which come to England in the form of extract, are obtained of a consistency equal to 30° Baume, which is equivalent to 1·261 specific gravity English, or 52° Twaddle. This is the usual standard, and that which is generally considered safe, for fluid extracts which are condensed to a higher degree than this, run a very great risk of damage to the material:—

English specific gravity.		"Baume."		"Twaddle."
1·170	equal to ...	21	=	34
1·200	„ ...	24	=	40
1·230	„ ...	27	=	47
1·261	„ ...	30	=	52
1·295	„ ...	33	=	59
1·717	„	60	=	143

Considerable quantities of dry extract, obtained from the chestnut tree, are brought over from France in the form of a dark opaque substance, not unlike common liquorice, but having a fracture like glass. This is done, no doubt, to avoid the large expense of freight, but sufficient stress cannot be laid upon the fact that extract obtained in this form must be prepared with the very best appliances, and great care taken in its manufacture, or the result will be a considerable loss to the maker, from the extract not being wholly soluble in water.

Should colonists or any enterprising firm be still uncertain as to the value of any tanning material, and how far it would be wise to convert it into extract, or otherwise, they can obtain more accurate information and the best advice on the subject by forwarding samples to me, and I will report not only as to the amount of tannic acid contained, but how far the material is suitable for the English market, and give advice as to the proper condition in which it should be forwarded.

I propose now to give an account of the principal substances used in tanning, and their respective values and uses for the guide of residents abroad.

BARKS.

TANNING BARKS.

Different varieties of oak are scattered all over the world, not only in a temperate, but also in tropical climates at the right altitudes. In many cases the twigs and leaves, as well as the bark, might be used to prepare extracts, such as are obtained at the present day from oak bark and oak wood.

Of the different varieties of oak, the following may be mentioned:—

Quercus Pedunculata and *Q. Sessiliflora* are the most valuable varieties of oak growing in England and on the Continent of Europe. These have for centuries supplied the bark with which the tanner has prepared the skins of animals and transformed them into leather. Notwithstanding the great variety of tanning products, which have been put on the market, none of them can take so high a position as the bark of the oak. The leather made with it being undoubtedly of the best kind, both as to colour and wear. Our readers may therefore safely prepare extracts from any of the oaks whose bark does not contain a dye. A well-made extract from the bark, leaves, or wood of the same having a ready sale.

The quality of oak bark varies considerably, the trees growing on good clayey soil yielding bark of a better kind than those which grow on calcareous soils. The aspect, also, has much to do with the quality; the bark removed from trees having a southern aspect is much to be preferred. Müller's analyses of oak bark show that the oak at fifty years' growth gives 13 per cent. of tannin; at one hundred years' growth it gives 8 per cent. of tannin.

Fifty years' growth, when the bark may be said to be in its best condition, yielding the largest amount of tannic acid: in some favoured samples 18 per cent. of tannic acid is given. As the tree progresses, the epidermis rapidly thickens, and the quality of the bark deteriorates. It is estimated that 200,000 tons are consumed yearly in Great Britain, besides 30,000 tons which are imported from the Continent.

Quercus Suber (Cork Tree Bark).—The inner layer of bark which remains after the removal of the cork, which is the rough and dead epidermis, is of a redder colour than oak bark, with a granular texture; it contains about 10 to 12 per cent. of tannin. The quantity imported varies considerably, from 8,000 to 10,000 tons being the average. In this country cork tree bark is principally used in Ireland.

The inner bark of the cork tree contains a large amount of tannin, as much as the best oak bark. It is extensively used by the tanners of Cadiz. Cork trees grown for tan-bark are usually stripped every thirty years, at which age they are entirely denuded of their inner bark and cork. This kills the trees, and they are then cut down to the roots, from which spring new shoots, which in their turn are subjected to the same process. The roots soon lose the power of sending up vigorous shoots and get worse and worse, until at eighty years very few stumps show any signs of life. Few cork plantations are cultivated for tan-bark, as they give a better return when preserved for their yield of cork.

ORAN, OR AFRICAN BARK (*Quercus coccifera*), is a bark of brownish-red colour, which has recently been imported, arising from the high price of other tanning materials. It gives a per-centage of 15 of tannin. The import for 1875 was 1,327 tons.

MIMOSA BARKS.—These barks, which are obtained from *Acacia mollissima*, *A. decurrens*, *A. pycnantha*, and *A. dealbata*, grow in Australia and Tasmania, and have hitherto come to our market in a rough or partially ground state, in which form they occasion much trouble to the tanner, as he has to pulverize them in order to obtain an extract. It would, therefore, be of great advantage if any, or all, of the different varieties of Mimosa Bark could, at the place of their growth, be converted into the pure extract, such as might save the English tanner all the trouble of preparation. The imports of Mimosa Bark into Great Britain in 1879 were 6,381 tons; in 1880, 7,800 tons; 1881, 5,752 tons, whilst in previous years it has occasionally amounted to 20,000 tons.

In January last a board of inquiry was appointed by the colonial council of Victoria, Australia, to consider and report upon the subject of wattle bark, with regard to the indiscriminate stripping of the trees caused by the increasing demand for bark in Continental and English markets, in addition to the requirements of Victorian tanners, which might lead to the early extermination of the trees or to a reduction of the supply necessary for the home trade even temporarily. The board was also asked to state whether forest regulations could be so framed as to conserve and encourage the growth of the wattle trees in order that a sufficient supply of bark might be insured for local requirements, as well as for the maintenance of the export trade.*

From this report it appears that two of the varieties of the wattle mentioned are extremely valuable, not only for the tanning material they furnish, but for their timber, which can be used for a variety of purposes, and for firewood, which is said to be of the very best description. Their remarkably rapid growth, too, should be taken into consideration as an important element in estimating their worth.

Of the tree known as the wattle in the colony of Victoria, there are three species, all of the genus acacia, from which the bark used in tanning is obtained. These are: *Acacia pycnantha*, commonly known as the "broad leaf," "golden," and "green" wattle; *Acacia decurrens*, or black wattle; *Acacia dealbata*, or silver wattle. The first named has a thick, glossy ovate leaf, the bark being thinner and smoother than that of either of the others. It is chiefly found on the south-western part of the colony and along the coast as far as the colony of South Australia. Its bark is generally considered superior to any other, but the habit of the tree is not so advantageous, being of slower growth and not attaining such large dimensions as the black and silver species.

The black wattle is found over all the western district of Victoria, in the north-east, and also in the district of Gippsland. It is of vigorous, robust habit, and for commercial purposes is equal to the broad-leaf species. From the rapidity of its growth, and the ease with which it can be stripped during the proper season, the board considered that, for all practical purposes, it was desirable to cultivate this species either alone or with the broad-leaf wattle. The silver wattle, for tanning purposes, is generally discarded.

Acacia decurrens (Willd.). The common or black wattle. A handsome tree of quick growth, attaining in favourable situations a height of 80 feet, with a circumference of stem in many instances proportionately large. It is gregarious in habit, and often grown in subalpine situations as well as in low-lying lands. Many forms or varieties occur, *A. decurrens*, var. *mollis* (*A. mollissima*, Willdenow), being that most generally met with in Victoria. This species is generally admitted to be the strongest in tannic acid. The bark is greatly employed in the Australian tanneries, and large quantities are annually exported to other countries. The tree is at maturity for bark-stripping at from 5 to 8 years of age, and is met with throughout Victoria growing thickly together over extended areas. In consequence of its profusion and rapid growth the bark splitters only remove the larger sheets, leaving the rest of the bark on each tree to be destroyed by decay or bush fires. A solid or catechu extract is made from this waste material, and can be supplied in quantities and at a cheap rate; it is rich in tan power, of a reddish-brown colour, soluble in water

---

[illegible]

and clear. The particular attention of tanners is directed to this article. It is found in Victoria, N. S. Wales, S. Australia, Queensland, and Tasmania.*

Acacia pycnantha (Benth.). The golden wattle. A handsome tree attaining a height of 30 feet or more, with a smooth reddish-brown bark, young branches often clothed with a rich bloom. Like *A. decurrens*, this species is gregarious in habit. It is frequently met with on river banks, but more commonly on knolls, and usually on poor ground. The bark affords a first-class tanning material. Victoria and South Australia.

Acacia retinodes (Schlechtendal). Bald Acacia. A small glaucous tree attaining a height of 20 to 25 feet, chiefly met with in open country and adjacent to water-courses. The bark is astringent and valuable for tanning purposes. Habitat, Victoria and South Australia.

Acacia dealbata (Link). The silver wattle. It is essentially an inhabitant of the banks of rivers and other water courses. In favourable situations it attains a height of 100 feet, and is of exceedingly quick growth. It is closely allied to *A. decurrens*. The bark is largely used for tanning purposes.

Wattle bark is of a closer texture than that of oak, the inner surface of a bright red, the epidermis varying in colour from light to dark brown. Fifty years since it was introduced to the notice of English tanners in the form of an extract, which was unsaleable. Since then the bark has been imported in large and increasing quantities. A good sample will give 24 per cent. of tannic acid. Coming to our shores in the roughly ground condition, it affords the opportunity for admixture of other inferior barks and rubbish, a practice which was resorted to by many shippers at the outset. Unless very finely pulverized, it requires hot water to extract all its tanning properties. Mimosa does not change to gallic acid ; or rather, the tannic acid of mimosa does not undergo the same decomposition as other tanning agents. The clear red liquor has considerable penetrating power, but the colour prevents any large quantity being employed. The leather made with it is hard, and rather disposed to be brittle in wear.†

Wattles grow on almost any soil, but their growth is most rapid on loose sandy patches, or where the surface has been broken for agricultural or other purposes. Where the soil is hard or firm it is recommended that plough-furrows should be made at regular distances of five or six feet apart, into which the seed should be dropped. The outer covering of the wattle seed is peculiarly tough—hard and horny in character—thereby forming a protection which renders the seed comparatively impervious to ordinary germinating influences. It will, therefore, be found necessary to employ a more direct agency than simply covering the seeds with earth. Water of a little less than boiling temperature should be poured on them, and they should be allowed to soak until soft. As the seeds are small and ought to be sown near the surface, a very light sprinkling of earth is sufficient. For all practical purposes it would be enough to drop the seeds about one foot apart along the furrows, in which case about 7,200 seeds would suffice for an acre of land. The wattle seed is cheap, and can be bought for 8s. or 10s. per pound. There are about 40,000 seeds of the black wattle to the pound. Those of the broad-leaf are one-fourth heavier, and consequently there are not more than about 30,000 to the pound. The seeds could, therefore, be dropped more plentifully with little additional expense, and the seedlings thinned out at discretion, thereby increasing the chances of a regular plantation. On loose sandy soil, on which *Acacia pycnantha* can best be raised, it might not be even necessary to break up the soil in any way; but it should be borne in mind that any opening up of the surface would materially accelerate the germination of the seed and subsequent growth of the seedlings. On such open sandy soil the furrow line might be dispensed with and the seeds scattered broadcast. When the young trees attain the height of three or four feet the lower branches should be pruned off, and every effort afterwards made to keep the stems straight and clear, in order to facilitate the stripping and induce an increase in the yield of bark. In all instances where attention is paid to the cultivation of wattles as a source of income, care should be taken to replace every tree stripped by successional sowings, in order that there should be as little variation in yield as possible.

---

* Victoria Catalogue Paris Exhibition.

† U. S. Government Report.

The wood of the wattle is of considerable value for industrial purposes. It can be readily utilized for cask staves, for axle spokes, for axe and pick handles, and many other articles requiring a tough and durable grain. When dried, it forms the best fire-wood known for culinary and all domestic purposes, also for ovens and furnaces. It emits a clearer and greater heat than other firewood. The wattles may be utilized also for fencing, the trunks making top rails of the best description. The commercial uses of the wattles are multifarious, as, in addition to the value of the bark and the wood, a good profit may be derived from the sale of the gum which exudes from the trees. Recently the price of Australian gum has increased thirty per cent. in the continental and English markets.

The character of the soil appears to affect, to some extent, the quality of the bark, this being clearly proved to the members of the board during their inspection of the North Gippsland district. A sample of bark from trees growing on a limestone formation was greatly inferior in tannin to that of bark obtained from another section of country, although the climate was in every way calculated to produce better results. From bark growing within five miles of the Buchan River 42 per cent. of tan material was obtained, while the bark taken from the limestone formation on both sides of the stream only yielded 29 per cent. Continuing the examination still further, the board found that the samples of bark obtained from the Goulburn and Western districts were about equal in point of tanning strength, both being a little inferior to the best bark obtained from Gippsland. The bark in each instance subjected to analysis was of the black or "feather" leaf species. The bark of the golden leaf or broad leaf wattle was also tested, and the result proved that its strength exceeded all the other barks by fully 5 per cent.

The size of the trees varied considerably in many districts, soil and position evidently effecting the difference. One of the largest black wattles met with in the western district gave a mean diameter of 24 inches, its age being ascertained to be eighteen years. This may be taken as the maximum size attained by this species; and, although even larger trees may be occasionally met with, the wattle is at its prime when about ten years old, and possessing a trunk 9 or 10 inches in diameter. After that the trees lose their healthy, vigorous habit, and are usually attacked by disease and wood insects.

In every district visited the most favorable specimens were selected for experimental purposes, and the following statement, which shows the average size of wattles at the ages mentioned, may be applied to the two different species recommended for cultivatien throughout the colony :

Species.	Locality	Years.	Diameter 3 feet from ground.
Black ...	Glenisla to Dunkeld (western district)	18	20 inches.
Do. ...	Parish of Bairnsdale (North Gippsland)	20	16 inches.
Do. ...	Tullarook to Yea (Goulburn district)	6	7 inches.
Do. ...	Buchan River (North Gippsland, limestone form)	6	5 inches.
Do. ...	South Gippsland, heavy, rank, forest lands ...	25	17 inches.
Golden ...	Wallington, Portarlington, and Queenscliff ...	9	8 inches.
Do. ...	Avoca and Castlemaine	10	7½ inches.

The following table shows the quantity of tan extractive in 100 parts of bark obtained from the districts mentioned ;

Species.	Where from.	Per cent. of tan extraction.
Acacia pycnantha, golden or broad leaf	Portarlington, Wallington, and Queenscliff	45
Acacia decurrens, black or feather leaf	North Gippsland	40
Do.	Wando, Dale, and Victoria Valley, western district	34
Do.	Goulburn Valley	34
Do.	Buchan River, North Gippsland, limestone formation	29

The percentage represents the extractive matter useful to tanners only.

Most of the tanners who were examined on the point stated that, in their opinion, bark possessed the maximum of tan strength when stripped during the last four months of the year, that being the season when the sap is most active. Independent of the fact that a renewal of the supply of tannin is thereby affected, the fact that the bark is stripped during the summer months and dried under ordinary summer temperature gives it a greater advantage than the bark stripped and dried during the wet months of winter : the bark being exposed to damp and moisture loses a proportion of its strength ; the process of drying being longer facilitates the change of tannic acid into gallic acid, or acids of a similar character—substances of no service in tanning.

Wattle bark, during a year's storage, improves in strength. This seems to arise from the augmentation of catechu-tannic acid through conversion or oxidation of catechuic acid, the latter possessing no tannic properties. Bark exposed to weather, and particularly to moisture, also deteriorates in strength by a change of some of the tannic acid into pyrocatechin or oxyphenic acid, and into phlobaphen.

At the present time there are tracts of Crown lands on which the wattle flourishes luxuriantly, although the soil is so poor as to be practically valueless either for pastoral or agricultural purposes. The board also noticed that many extensive areas of land in the districts specified were leased for grazing purposes at a nominal rent, and it was often on patches most barren of grass or surface vegetation that the finest specimens of wattle trees were met with.

Wherever a bush-fire has passed over the country myriads of young wattle trees sprang up. Wattles also spring up in immense numbers where the surface of the soil has been disturbed; this being established by the appearance of a number of paddocks formerly under cultivation, but allowed to lie fallow for three or four years, being literally covered with wattles of both the species most prized by the tanners. No doubt can exist that the wattles are easy of cultivation and remarkably prolific in the matter of seed. On poor lands the wattles grow as readily as grass; in many instances more so. Cultivation will have the effect of increasing the quantity of bark available for commercial purposes to almost any extent.

The age at which trees may be stripped with the best advantage has been determined at from five to ten years.

So impressed were the members of the board with the value of these trees and the importance of encouraging their culture, that they submitted in their report the following recommendations, based on the result of their personal observations and a careful review of all the evidence taken during the course of their investigations:

That the principle of wattle cultivation should be adopted by the State and also by all local governing bodies having the control of reserves or tracts of unoccupied lands. Wattles should be grown on the main roads, along the lines of railway, and on all lands which are not available for other purposes.

That certain areas of poor land at present lying waste should be reserved from selection (or alienation in any other form), and devoted to the systematic cultivation of wattles; these areas to be surveyed in blocks of, say one thousand acres, and let by tender, as wattle-farms to any persons who should produce evidence of the *bona fide* nature of their application; the farms to be let on lease for ten or more years, and on the expiration of the term of lease the land to revert back to the Crown, the lessee to be afforded the first option of re-lease, or to be entitled to compensation for all improvements effected during his tenure.

That the State should also encourage the cultivation of the wattle on selected lands still in a measure under the control of the government. In all cases where a selector should adopt the systematic rearing of wattles on his holding, and produce a certain number of tons of bark per annum, that this should be considered an improvement under the land act.

Profit to be Derived from the Systematic Cultivation of Wattles.

Receipts derivable from a wattle plantation of, say, 100 acres, planted in the manner proposed.

Each acre planted with wattles, 10 feet apart, would carry 400 trees; at the end of the fifth year trees would yield, say, 56 pounds matured bark; stripping only every third tree, 333 tons would be obtained from 100 acres; this at £4 per ton would give for the first stripping	£1,332 00
In the sixth or following year a similar number of trees would be stripped, the bark having increased in weight, say, 14 pounds; the increased yield of second stripping would, therefore, be 400 tons, at £4 per ton, making	1,600 00
In the seventh year the remaining trees would be stripped, from which a still greater increase would be obtained, say, 480 tons, at £4, making ...	1,920 00
The aggregate yield of bark during the first eight years would be 1,213 tons	4,852 00

Estimate of expenditure on a wattle plantation of 100 acres during eight years

Rent of 100 acres for eight years at the rate of 6s. per acre per annum ...	£240	00
Ploughing 100 acres in drills 10 feet apart	25	00
Sowing wattles and actual cultivation, including cost of seed	37	10
Supervision for eight years, nominal, say, £10 per annum	80	00
Pruning the trees, taking off useless wood, &c. (only necessary for two years), 10s. per acre	50	00
Incidental and unforeseen expenses	27	10
Interest on the whole amount expended during the eight years	240	00
Actual cost of stripping and carting*	1,515	00
	2,215	00
Profit balance, exclusive of improvements or supplementary sowings† ...	£2,637	00

In 1878, from January to June, 9,871 tons of wattle bark, valued at £72,708, an average of about £7 10s. per ton, were exported from the colony of Victoria, against 1,884 tons in 1870, worth then only £4 12s. 9d. per ton.

In 1877, England imported 12,428 tons of bark, worth £136,944, a little more than £11 per ton, from Australia, all of which was probably wattle or mimosa bark, as it is also called.

This shows a steady and increasing demand for wattle bark, and a continued appreciation of its value as a tanning agent. In England the best oak bark is worth 32 dollars per ton, a little more than half the price of wattle bark. It is probable, however, that the difference in price is owing to the superior richness of the wattle in tannic acid, as oak-tanned leather is certainly held in higher estimation in England.

Exact information with regard to the climate of the colony of Victoria has been furnished by Mr. Robert Ellery, government astronomer at Melbourne, in his report of 1872. The mean annual temperature at Melbourne during fourteen years was 57°.6, and that of the whole province 56°.8, including stations 2,000 feet or 1,400 feet above the sea-level at Daylesford and Ballarat. This is equivalent to the mean annual temperature of Marseilles and Florence, in the northern hemisphere, but the climate of Melbourne is much more equable than that of the Mediterranean shores. The lowest temperature yet recorded has been 27°, or 5° below the freezing point; the highest, 111° in the shade. At Landhurst, 778 feet above the sea, the greatest extremes of temperature yet observed were 117° and 27°.5. At Ballarat the extreme winter cold was 10° below freezing.

The amount of humidity in the air is liable to great and rapid variations in the summer months. It is sometimes reduced as much as 60 per cent. within a few hours by the effect of hot winds. But this is compensated by an increase of moisture upon a change of wind. The average annual rainfall at Melbourne, which for thirty years is stated at 25.66 inches, does not seem less than that of places in similar latitudes in other parts of the world. Yet it proves inadequate, because of the great amount of evaporation, estimated by Professor Neumayer at 42 inches.

---

*The cost of stripping would not exceed 15s. per ton on account of the facilities presented by the regularity of the trees, while carting would represent another 10s. per ton. These combined charges would be 25s. per ton, and on 1,215 tons would be £1,515, leaving a clear profit on the 100 acres (after allowing for the primary expenditure) of £2,637.

†In addition to the bark taken off the land a fresh supply would be available in two seasons afterward, as the board recommends that every fresh tree stripped should be replaced by another sowing. All improvements effected may be calculated as additional profit.

From the foregoing it is almost safe to assume that the climate of a large portion of our Southwestern and Pacific States is peculiarly well suited to the growth of the wattle. There seems to be hardly any doubt that vast stretches of land that are now destitute of trees might in a very few years be covered with a growth of timber, every particle of which, from the bark to the roots, would be most valuable. The lack of rain, which is the principal cause of the absence of timber on most of our prairies, would not interfere with these hardy trees, and it has been demonstrated that the cost of planting them is almost nominal. Although it is not distinctly stated in the report of the board, it is evident that no fences are needed to protect the young wattles from grazing stock. Assuming, therefore, that fences are not necessary, and that wattles may be grown on land actually in use for pastoral purposes, some of the items set down in the board's estimate of the cost of planting may be stricken out and others materially reduced.

The tree arrives at maturity in ten years, and in half that period attains a growth sufficient to make it valuable for many useful purposes. In the treeless sections of our country, therefore, if wattles were grown, even if the bark could not be utilized on the spot, and the wood only could be used in the mechanical arts and as fuel, it would always pay to preserve the bark for exportation, as in England it is worth, according to quality, from £5 to £10 per ton. At points remote from seaports the tannin could readily be extracted and forwarded for shipment in a concentrated form.

BABOOL BARK (*Acacia Arabica*).—This tree grows very abundantly in certain localities in the East and West Indies, and the bark yields a large percentage of tannic acid of the best quality, which gives a good colour and texture to the leather, We believe not only the bark, but the fruit, and even the small twigs of the tree might be used for the manufacture of extract. The quantity imported has been but nominal hitherto, but when its full value is realised, we imagine that its growth will be encouraged by the native tanner, not only for home consumption, but also for the manufacture and export of extract of the best kind.

MANGROVE BARK (*Rhizophora Mangle*).—This bark abounds in all tropical countries, growing on the banks of the rivers and estuaries, and in marshy places. It is used by the tanners in the localities where it abounds, but hitherto has not been profitably employed in England, from the fact that the leather made with it is of a bad colour and spongy nature. It has been tried on a large scale in England, but the result has always been the same, the leather being very inferior in colour and quality. A good deal of cheap leather which reaches us from India, is tanned by means of this material, and has to be corrected by the use of Myrabolans and other tanning materials in this country of a saleable colour. Tanners in other parts of the world where the Mangrove flourishes, might use it in this way with profit.

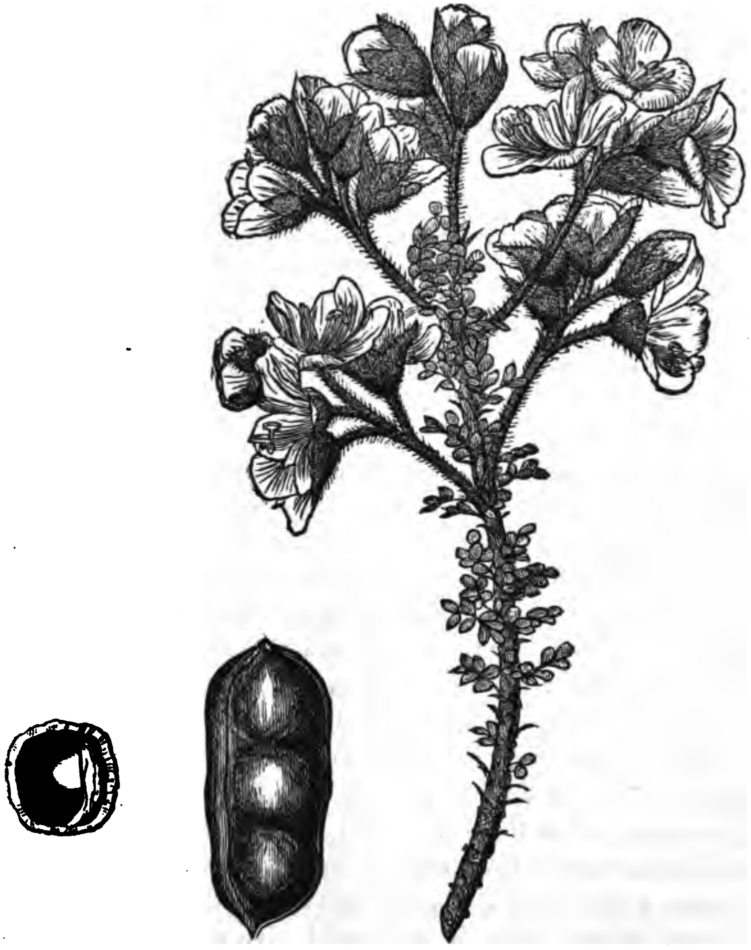
In India it grows to the height of 50 feet, spreading out its roots in all directions in the moist soil. The mangrove appears to thrive in brackish water. As the muddy deposits at the mouth of the tropical rivers become consolidated, the mangrove takes possession even to the verge of the salt water. All parts of the tree appear to be useful for tanning; the bark, roots, and leaves have been so applied. It contains about 17 per cent. of tannic acid.

QUEBRACHO WOOD (*Loxopterygium Lorentzii*).—This tree grows in the country through which the River Plate in South America runs, and has been introduced during the present century, more especially by the French tanners, with whom it has grown in favour. A great disadvantage in the use of this species of tannin is the fact that the wood is very hard ("Quebracho" meaning *break-axe*), and to obtain a proper decoction of the same, considerable expense has to be incurred in new machinery specially fitted for pulverising the wood, but if the producers of this article, living on the spot, could bring the wood into a proper condition of pulverisation, or obtain the extract from it, they would at once secure a better hold on the English market. In this matter great stress should be laid on the fact that another tree, called *Acacia curupy*, is used in the place of Quebracho Wood. This I apprehend to be a considerable adulteration, and all manufacturers of extract should bear in mind that extracts in England are, at present, on their trial, and their future success will depend much on the pure article being sent over.

In 1880 we paid, according to Mr. P. L. Simmonds, for bark for tanning purposes 3 million pounds, and 1¼ millions for other tanning substances; and, according to the high authority of Mr. Gladstone, the whole value of our imports are £411,229,595. It must be borne in mind that the relative proportions of oak bark to other tanning materials has greatly altered since 1830. Then oak bark was the main staple of the trade, now it is but one of fifty or more competitors, and whilst the consumption of bark has remained stationary, if not less in quantity, the employment of other materials has enormously increased, and still continues—of this I hope to give proof as I proceed.

FRUITS.

BALSAMOCARPON (*Cæsalpinia brevifolia*).—It is called "Algarrobo" by the Chilians. In 1876 a supply of this valuable tanning material was brought to this country, having been previously tried with great success in France. Messrs. Hepburn & Co., of London, who are always open to try experiments with anything likely to give a successful result, allowed a certain number of hides to be placed in their pits alongside of a similar quantity



BALSAMOCARPON (*Cæsalpinia brevifolia*).

small quantity of Balsamocarpon fruit was placed in the pits, and the foreman tanner was quite elated at seeing the hides advance more rapidly than under his old process. At the end of a month a larger quantity was placed in the pits with the hides, but even then, to use the foreman's words, "the gentleman only shook a small quantity out of a tin box he carried in his hands." In six weeks' time, the pits working under the old process had to give way, because the hides treated with the Balsamocarpon rapidly went ahead, and in three months the leather was pronounced to be perfectly tanned, so that experts, who examined the leather, selected it in preference to those hides which had taken one year to tan. In this pod there are seeds and a thin web-like husk; the rest contains at least 80 per cent. of tannic acid, so that it is nearly pure tannin.

> Balsamocarpon appears to differ from other agents in being of great strength and very rapid in its action. It is quite soluble in water, and is therefore gathered before the rains, as otherwise the fruit is washed to the ground, and found in quantities mixed with the soil. The tannin of balsamocarpon changes very rapidly into gallic acid; so rapid is the decomposition that, to secure the full benefit of the tannic acid, the infusion has to be applied directly to the leather. The usual mode of proceeding is to supply small quantities to other ingredients after the leather has been some time in tan.*

It occurs in the form of pods, which are very easily crumbled in the fingers, and a yellow dust falls off, a thin fibrous skin only remaining after the pod has been shaken free of the tannin.

Balsamocarpon comes to this country generally separated, one sort being beautifully bright and of a yellow colour, and consisting of the pods picked from the tree, and the other of pods having a very much darker coloured surface, and looking as though they had been wetted—these are picked up from the ground, where the dew or rain very soon dissolves the tannin; they are consequently worth £4 less per ton than the bright yellow pods. The last shipment at the end of 1881 amounted to about 100 tons, half of which went to Liverpool and half to Havre. It fetched about £18 a ton, simply from the fact of falling into the hands of brokers, who knew nothing about it and could give no explanation to the tanners, whereas if it had come direct to anyone who knew its value, the whole would have realised £25 a ton at least, and then have been remarkably cheap for the tanner. Everyone who has used this material, declares it to be the most valuable tanning material known.

---

* U. S. Government Report.

Tanners, in using Balsamocarpon in the pits, generally make the mistake of employing it like other tanning materials, but this is not the correct mode of using it, the best plan being, after the leather has advanced to a certain stage, to add the Balsamocarpon in small and increasing quantities to the leather, the peculiarity of this kind of tannin being that the tannic acid rapidly changes into gallic acid, and therefore it is necessary to apply it direct to the leather in the process, as otherwise the great proportion of the tannic acid is lost.

I have from time to time distributed seeds through all parts of the world where the plant would be likely to thrive, but I have not heard of its being successfully cultivated up to the present time. Its native *habitat* is on the top of the mountains in Chili, where it grows in the form of a scrubby bush.

An examination was also made of the pods of the *Balsamocarpon brevifolium* ("Algarrobo or Algarrobilla"), a plant growing in Peru, the seed pods of which are said to contain over 60 per cent. of tannic acid. Analysis showed a somewhat smaller amount than that mentioned, but about 20 per cent. of gum, and a little resin. [Probably the inferior quality above-mentioned was examined.—Ed.]

This substance seems well adapted for the manufacture of ink, for which purpose it is said to be extensively used, but it hardly appears possible that it should add very greatly to the commercial supply of tannin, owing to the difficulty of obtaining it.*

DIVI-DIVI (*Cœsalpinia Coriaria*).—A native of Central America, from which our supplies have hitherto come, but it is known to grow in other parts of the world where the climate and conditions are favourable. It grows in the East Indies, as may be seen from the following quotations:—

In the *Tropical Agriculturist* of September 1st, 1881, p. 353, Dr. Trimen says:—

> "The fine old tree of this species, near the entrance to Peradeniya, affords an abundant crop of pods every year, and there can be no doubt that the plant would flourish generally at the lower elevations in Ceylon."

The following paragraph taken from the *Tropical Agriculturist*, Dec. 1st, 1881, p. 567, is to the same effect:—

> "This plant, which grows in many of the outlying villages of Madras, and has been up to date uncared for, is now found to be a valuable article for tanning purposes. Large quantities of the pods these plants yield are

---

* U. S. Government Report.

being shipped to Europe, and in fact many persons have begun to pay some attention to the cultivation of this plant. A consignment of 88 bags of dried fruits from this plant was shipped to England per the *Duke of Buckingham.* 173 trees of the Divi-Divi in full bearing, which would take an acre of land, are supposed to yield 50 cwt. of pods, which are valued in London at £37 10s., and as the cultivation and care costs literally nothing after the trees are once in bearing, it is found to be a most profitable crop."

No doubt when its value is fully known from other localities, it will be readily procurable. The tannic acid of this variety is found in the yellow pulp, just under the skin of the pod. The pod itself may be readily recognised, from the fact that when it is dry it almost always contracts to the shape of the letter "S." The tannin is very strong, but the seeds (contained in the pod) have in their composition some kind of oil, and probably an albuminous substance, which, when the Divi-Divi is used in the tanning process, induces, during certain changes of the weather, a kind of fermentation and discoloration, which, if not at once arrested by means of chemical agents, causes great damage to the leather. In this instance, therefore, it would be much to the advantage of tanners if an extract could be prepared in the localities where the tree grows. This extract might be prepared from the fresh fruit, without crushing the seed, and as the oil, &c., would then probably not be set free, the cause of fermentation and discoloration would be altogether removed. For the above reason, the use of Divi-Divi is very limited in this country. Only one or two tanners seem at all able to use it profitably and without any risk. This is attributed to some peculiarity in the water they employ, and experiments are being made with a view to determine if such be the case.

Divi-divi gives great weight compared with other materials, but the leather is generally of a darker hue. It also imparts to the leather a horny feeling in dry weather, with a great affinity for damp in wet weather. The best divi-divi contains 56 per cent. of tannin.

BETEL NUT (*Areca Catechu*).—Although this nut contains a quantity of tannin, and an extract is made from it, its principal use at present is as a stimulant in conjunction with lime and the leaf of *Piper Betel.* I insert the following interesting abstract to show how abundant the tree is, and what a prolific source of tanning material it might become:—

* The native country of the betel nut is unknown, but is supposed to be the Sunda Islands; the tree, from time immemorial, has been extensively

cultivated in all parts of the East Indies, so that we are unable to trace it back to the spot whence it originally may be supposed to have come. It grows freely in all the eastern islands, from Sumatra to the Philippines, and seems to have as many distinct names as there are languages. Thus in Malay and Chinese it is called *Pin-lang* or *Pinang* (giving its name to the island in the Straits); in Sumatra, *Jambi;* in Bali, *Banda;* in Bugis, *Rapo;* and in Tagala and Bisaya, *Bongo;* in Acheen, *Penu;* in Sanscrit, *Goorvaka;* in Bengalee, *Goon;* in Arabic, *Fofal;* in Persian and Hindustani, *Soopara;* and in Telugu, *Poka Chettu.* Judging by this, the probability is that the tree is indigenous in each country. In the fresh or green state, the betelnut is an object of general domestic consumption; and in the dry state, of large exportation to China and India. Fifteen tons of these nuts were shipped from Singapore in 1858, to the single port of Ningpo. The shipments from the Straits Settlements in 1867 were 3,820,457 cwt., valued at £120,626. From Pinang the exports in 1870 were 166,111 piculs. The most productive countries in this article are Ceylon, and the northern and southern coasts of Sumatra, towards its western extremity. At Billiton, in the Eastern Archipelago, there were in 1874 over 65,200 Areca palms.

---

* Tropical Agriculturist.

At Travancore, where the betel nut is a staple product, a quarter of a century ago, there were ten and a quarter million of trees growing, which, at the average yield, would produce about 63,000 tons of nuts. From the Madras Presidency there was shipped to Bombay in 1872-73 43,958 cwt., besides about two millions of the nuts unhusked. In Penang there are half a million, or more, betel palms, producing upwards of 3,000 tons. The Pedir coast of Sumatra produces annually about 4,700 tons, of which half is exported. The Chinese receive from thence 3,000 tons, besides as much more from Cochin China. When there is not an immediate demand for the nuts they are stored in the husk, but insects attack them freely. Of the nuts produced in Travancore, 300 tons of prepared nuts are annually sent to Tinnevelly and other parts of the peninsula, and about 3,000,000 ripe nuts, in the husk, to Bombay and others places by sea. The local modes of preparing the nut for use in Travancore are as follows:—Those used by families of rank are collected while the fruit is tender, and the husk, or outer pod, is removed; the kernel, a round fleshy mass, is boiled in water. In the first boiling of the nut, when properly done, the water becomes red, thick, and starch-like, and this is afterwards evaporated into a substance like gambier or catechu. The boiled nuts being now removed, sliced, and dried, the catechu-like substance is rubbed on them, and when dried again in the sun they become of a shining black colour, and are ready for use. Whole nuts without being sliced are also prepared in the same way for use. Ripe nuts, as well as young nuts in the raw state, are used by all classes of people, and ripe nuts which have been steeped or kept in water, are also used by the higher classes.

At Pedir, Acheen, and other parts of the East, betel nuts are sold by the loxa or laxar, which weighs about 168 lbs., and consists of 10,000 nuts, with from 10 to 25 per cent. added, according to the bargain previously made, to make up for nuts which may be worm-eaten or otherwise damaged.

The nut is conical, but varies, in some having an elevated apex and small base, in others a large base, and a very slightly elevated apex. The nuts are gathered in July and August, though not fully ripe till October. The quality of the nuts does not at all depend upon their size, but upon their natural appearance when cut, indicating the quantity of astringent matter contained in them. If the white or medullary portion which intersects the red or astringent part be small, has assumed a bluish tinge, and the astringent part itself be red, the nut is considered of good quality; but when the medullary portion is in larger quantity, the nut is considered more mature, does not possess so much astringency, and is therefore not so much esteemed.

The Nagar division of Mysore, in consequence of its hill tracts and moist climate, offers peculiar facilities for the cultivation of this palm. So we find almost every hut sheltered by a shady grove of these trees, whose slender forms sway with the breeze, and whose fringy tops, whilst murmuring amid the mountain solitude, cast a fragrance around the root from their aromatic blossoms.

The land most congenial to its growth seems to be a level cut on the slope of a hill, or some sheltered valley rich in vegetable deposit. That it is a tree requiring manuring like the plantain is obvious, from the trees requiring trenching and manuring round the roots annually to ensure a good crop of nuts.

The ripe nuts are gathered, and, after being peeled on a sharp knife fixed on a board, are cut in two, and dried in the sun. Another process is slicing the nut and parboiling it.

The Mysore nut is considered superior to all others, and forms four-fifths of the consumption in Madras.

The nut imported from Ceylon and the western coast is not so much appreciated, and commands a much lower price in the market.

The land devoted to the areca and cocoanut palms in Mysore amounts to 48,000 acres, of which the bulk (43,000 acres) is under areca trees. The quantity of betel nuts exported in 1869 was 5,069 tons, valued at £300,486.

In the northern coasts of Acheen, especially Pedir, much attention is given to the Areca palm, and large quantities of betel nuts are sent to Penang and the Coromandel coast. The total production is estimated at upwards of 700,000 piculs yearly. In 1874 114,843 piculs were shipped to Penang.

The following table gives the exports of Areca nuts from Ceylon for a series of years:

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	cwts.	£		cwts.	£
1850	66,254	42,907	1863	68,406	51,304
1851	78,030	54,806	1864	54,326	40,715
1852	71,794	52,230	1865	62,616	46,962
1853	59,396	46,433	1866	94,540	74,980
1854	46,209	32,175	1867	99,159	74,369
1855	47,399	42,191	1868	93,731	70,298
1856	66,429	50,183	1869	67,759	50,822
1857	47,594	45,438	1870	76,558	65,501
1858	69,088	51,816	1871	66,543	62,594
1859	49,972	11,111	1872	71,715	64,966
1860	75,996	56,997	1873	146,484	85,300
1861	69,558	52,168	1874	129,826	108,730
1862	55,372	41,529			

POMEGRANATE RIND (*Punica Granatun*).—The peel of this fruit is said to be used in the manufacture of the celebrated morocco leather, the only kind which, when used for binding books, is but little affected by atmosphere in which gas is burnt.

MYROBALANS (*Terminalia Chebula*).—The imports in 1878 were 25,885 tons; in 1879, 8,193 tons; in 1880, 7,936 tons; and in 1881, 7,792 tons. There are four varieties:—Chebulic (*Terminalia Chebula*), Citrine (*Terminalia Citrina*), Belleric, or a Bastard (*T. Bellerica*), and Emblic (*Emblica Officinalis*).

Some are small, wrinkled, and of a yellowish colour; others are larger, round, and of a darker hue. The latter appear to have been gathered when dead ripe, and are therefore deficient in tannin. A good sample of myrobalans will give as much as 40 per cent. of tannic acid. Import into England, 1867, 64,243 cwts.; 1874, 11,230 tons; 1875, 9,800 tons. The growth of the supply has been rapid, and is still on the increase. Myrobalans deposit a large amount of *bloom* or *ellagic acid*. During the process of tanning they yield a considerable amount of acetic and gallic acid, and would be invaluable to the tanner, were it not that they make leather soft, and have not such weight-giving properties as valonia.

Myrobalans are imported from India. The larger kind from Bombay, and the smaller from Madras, but the quantity that might be obtained, if the two were cultivated, would be inexhaustible. The fruit (the larger variety of which is about the size of a nutmeg, and the smaller of a hazel nut) is alone used; it contains a hard stone in its interior, and as it has to be ground in special mills in England, on account of the powder being excessively irritating to the respiratory organs, a considerable outlay of capital in machinery is involved, and adds considerably to the cost of the crude materials. If a properly prepared extract of these different varieties could be obtained in India, there would be a very large demand for it by the tanners of England. The peculiarity of the tannic acid of this variety is, that it is generally employed to qualify or tone down the bad colours of other tanning materials. Used alone it makes a soft spongy leather, but employed, as in the finishing process, to give a good colour to other leather, it is very valuable.

Extract of Myrobalans is, I believe, at present being manufactured by some firms in India.

VALONIA (*Quercus Ægilops*).—This oak tree grows in Asiatic Turkey, from the great central export town of which (Smyrna) we now obtain the rough acorn-cup, under the name of *Valonia*. The amount imported into the United Kingdom in 1880 was 37,043 tons, and in 1881, 27,091 tons. This is one of the most valuable tanning materials that the tanner has to depend upon. Throughout Asiatic Turkey this variety of oak grows in profusion, also in Greece and the Morea, and in Palestine on the eastern side of Jordan, amongst the mountainous country which was once the land of Gilead. No doubt, over the whole of that part of the world, this oak tree *(Quercus Ægilops)* could be grown to great profit with proper care and attention. Besides the regular supply of *Valonia*, the best of which at present is almost exclusively taken by the Germans and Austrians (the English not paying a sufficiently high price for it), there is a second-class *Valonia*, which is deficient in tannin and in colour; large quantities of the dust of *Valonia* also remain at the seaports, and no doubt further up in the country. Both of these might very readily be converted into an extract, but are now completely wasted.

The average quantity of *Valonia* we have imported for several years has been from 30,000 to 35,000 tons; in 1879, 31,537 tons; in 1880, 37,043 tons. The stationary condition of the trade in this material is no doubt mainly owing to the miserable condition of Asiatic Turkey, the insecurity of life and property preventing the introduction of capital into those disturbed districts. There is no question the crop might be trebled in amount, if facilities could be given for its cultivation. Before leaving this part of my subject, I cannot fail to notice the elegant and unique exhibition of *Valonia* at the Agricultural Hall this year. Messrs. F. Honischer & Co., of London, deserve commendation for the fine and choice specimens of *Valonia* exhibited.

A good sample of Valonia should be composed of medium-sized cups, the rim or wall of the pericarp very thick, with the exterior spines small and uniform in size. The cup, being cut or broken, should give a bright drab fracture. The fruit ripens in July and August, when the trees are beaten, the acorns remaining on the ground to dry. The two oaks to which we are indebted for our supply of galls and valonia, *Quercus infectoria* and *Q. Ægilops*, grow side by side over a large proportion of Asiatic Turkey, so that with a little attention the crop of both could be trebled. Valonia is valued by the tanner, because it imparts to the leather firmness and weight. When used alone, the leather becomes too hard and brittle for general purposes; it therefore is almost invariably mixed with oak bark or other agents, such as myrobalans and mimosa. A good sample of valonia yields 26 to 32 per cent. of tannin.

GALLS.

OAK GALLS.—These are the most valuable and important of all tannin matters.* They are the produce of the female of an insect called *cynips* (gall insect), which pierces the buds on the young branches of the *Quercus infectoria* and other species of oak. The eggs therein deposited soon hatch, while the bud loses its natural growth and swells out to the size of a hazel nut. When perfect, the insect punctures a hole and escapes. Good gall nuts should not be so pierced; they should be heavy, and of a fresh green colour, and are called "green galls." If the insect has escaped, they are yellow and inferior (" white galls ").

Worm-eaton oak galls are sometimes doctored by filling the holes with wax. The fraud may be detected by immersing the galls in boiling water, which melts the wax and renders the holes visible. Exhausted galls are occasionally coloured by washing them with a solution of ferrous sulphate, which is readily detected by its chemical reactions. Aleppo galls are considered the best kind.

CHINESE GALLS are found growing upon *Rhus semialata.* They are very light and hollow, and distorted by numerous protuberances, and are completely covered by a thick velvety grey down. Chinese galls are much used for the preparation of tannin, of which they contain about 70 per cent. English galls from the common oak are much inferior to the foreign varieties. They are smooth, brown, and slightly speckled with pale brown excrescences.

TAMARISK GALLS (*Tamarix Gallica*). Natural name *Sumrat-úl-túrfa* (Arab.), *Bara mai* (Hind.).—This small gall grows in great profusion in certain districts in India, and in the Mediterranean, and on the Northern Coast of Africa. It is valuable, as giving a very large per-centage of tannic acid. Hitherto the supply has been precarious, so that it has not been used so extensively by English tanners as might have been expected. The leather made from this variety of tannin is of the best description, both in colour and texture. It appears that the tree yielding this gall might be cultivated with little expense on waste, brackish lands, which would be unavailable for other purposes. If extract could be obtained from these galls, pure and in sufficient quantity, it would meet with a very ready sale. Similar galls, but smaller, are obtained in India from *T. Orientalis* (Vahl) and are known under the names of *Sumrat-úl-asl* (Arab.) and *Chota mai* (Hind.); also in Algeria, from *Tamarix articulata.*

---

* A sample of gall-nuts analysed by Guibourt contained,—tannic acid, 65·0; gallic acid, 2·0; ellagic and luteo-gallic acid, 2·0; chlorophyll and volatile oil, 0·7; brown extractive matter, 2·5; gum, 2·5; starch, 2·0; woody fibre, 10·5; sugar, albumen, and ash, 1·3; water, 11·5 per cent.

Tamarix indica and *T. africana* yield the small galls found on the tamarisk plant, about the size of a pea. They appear to be used medicinally in India, and occasionally small quantities reach England. When better known, and their tanning properties more fully recognized, they will be cultivated more extensively. (These galls contain 50 per cent of the purest tannin with which we are acquainted.) The galls of *T. articulata* are exported from Algiers, being the growth of Morocco.

LEAVES.

SUMACH (*Rhus Coriaria*).—There are several varieties of this tanning material. The largest proportion comes from the Island of Sicily, where for hundreds of years it has been manufactured from the leaves of the bush. Other species of the same genus are known to abound in North America and other parts of the world, and these, although not quite so good as the Palermo article, may be profitably employed in obtaining an extract from the leaves. A very large demand for this material will be found, not only for the use of tanners, but also for curriers and dyers. I have every reason to believe that Sumach can boast as great an antiquity as oak bark. Its value as a tanning agent appears to have been fully recognised by the Romans; whether or not they introduced it into Great Britain I cannot say; but its import into Great Britain for tanners', curriers', and dyers' work dates back some hundreds of years. And looking at the figures given previously in 1829, it will be seen that its use is still on the increase—

Value of Sumach	imported	in	1829... ...	£26,523.
Do.	do.	do.	1880... ...	£180,000.

Sumach consists of the powdered leaves and twigs of the Venus sumach, or wild olive, and the elm-leaved sumach (*R. cotinus*). The plants are widely spread, being found in the south of Europe, Asia, and United States. Dyers are the principal consumers of the sumach obtained from the *Rhus cotinus*. *Rhus coriaria* grows to the height of 8 to 12 feet. It is found wild in all the countries bordering the Mediterranean, Spain, France, and Italy, producing sumachs of different values. Sicily supplies the best. Palermo sumach is of world-wide celebrity. In 1873 there were fifteen steam mills at Palermo for grinding sumach, and the trade is rapidly increasing. The quantity exported from Sicily in 1842 was 123,305 tons. Imports into England, 1840, 9351 tons; 1845, 11,398 tons; 1850, 12,929 tons; 1870, 14,431 tons.

ROOTS.

The tanning roots here mentioned have not as yet been used to any extent in this country, but I have thought it well to call attention to them in order to show the importance which is attached to these tanning materials in the United States.

CANAIGRE *—This root grows in Texas, where it has long been used by the Indians and others for tanning purposes, and is said to be used at present at several tanneries in and about San Antonio. From the analysis it appears that the root contains about 23 per cent. of tannic acid, and the fact that the article is employed in tanneries would seem to indorse its practical adaptability as a tanning material.

Canaigre is the bulbous root of a kind of dock specifically called *Rumex hymenosepalum.* It grows plentifully in sandy soils over a large territory on both sides of the Rio Grande, and from thence northward over a large portion of Western Texas. The bulbs are produced in clusters like some kinds of sweet potatoes, some clusters weighing several pounds, and can be procured, it is stated, at a cost not exceeding $1 per 100 pounds.

The leaves of the plant are somewhat fleshy when in the young state, when they are greedily eaten by cattle, and occasionally used as a pot-herb by travellers and others.

Roots planted last year in the grounds of the department made only a feeble growth before the leaves decayed. They started into growth quite early last spring, and were slightly covered during several nights of heavy freezing weather. They were not perceptibly injured by the cold, and as the season advanced the plants made a favorable growth, throwing up robust flower stems, which blossomed freely, and, although the seed vessels formed, the seeds failed to mature before the leaves turned yellow and decayed, the plants resuming the deciduous state.

It is probable that the plant naturally starts into growth very early in spring and rapidly matures, after which the leaves die, the root bulbs probably remaining in the so-called dormant condition for many months. The plant evidently requires a climate where the winter is short and not severe, and a dry, warm, sandy soil.

The examination of two new materials, the Algarobo and the Canaigre, for tannin, shows the existence of a very abundant source of this important material, and gives reason for the belief that the latter at least may soon afford a cheap supply to the arts. Thus far only a preliminary examination has been made, but the investigation is being continued, and will, it is hoped, have reached definite conclusions before the publication of the annual Report, of which this will be a part. The importance of a new and cheap source from which tannin may be readily obtained can scarcely be overestimated, and the most dilligent prosecution of this search in various directions will be continued until success is assured. The amount of barks and other substances, valued for their tannin, reaches many millions of dollars yearly, and, if the canaigre root answers our expectations, the world's supply may be easily grown by our own people.

The importance of a new and abundant source of tannin can hardly be overestimated. While in the oak and hemlock bark and sumach of the country the United States will probably have enough tannin material to answer their own purposes for the next generation, yet there is a large

market in other countries, which is now supplied from very many sources, involving the expenditure of millions of dollars. If it is possible to add to our agricultural exports a substance which can be produced at a profit, and command any considerable portion of the world's market for tannin materials, it is well worthy an effort on our part to secure, either by importation or naturalization of foreign plants, such as the wattle, or to utilize any that are native within our own borders for this purpose. The utilization of the sumach, which grows wild over so large an extent of our country, has been encouraged by a thorough examination made by Dr. Murtrie, a former chemist, and being published in our last report has attracted very great attention throughout the country, and has given an impetus to the utilization of this bush, which is a common growth by the way-side and in neglected and abandoned fields.

A clearing out of the rooms devoted to the Chemical Division of the department incident to the induction of our present chemist disclosed, among other things which had been stowed away, evidently for years, the following correspondence, accompanying a parcel which apparently had never been opened. As there is strong probability that the root inclosed in this package will prove to be of great importance, the entire correspondence connected therewith is cited in this report:

SAN ANTONIA, TEX., *July* 9, 1868.

SIR.—I have the honor to hand you herewith a copy of a letter written by John James, Esq., of this city, in relation to the roots of the plant *canaigre*, a package of which will be forwarded by the same mail that brings you this letter. The plant is found growing in the vicinity of Fort Clark, on the banks of Limpia Creek, and can be cultivated to any extent in Western and Northwestern Texas, where it sometimes grows to the thickness of a man's leg.

Any quantity of hides can be obtained here, and many thousands are shipped north, and manufactured leather is returned to the State. If all that is claimed for the canaigre is true, it is destined to effect a great change in the leather trade of Texas.

Respectfully,
S. P. GAMBIA, *Postmaster.*

HON. COMMISSIONER OF AGRICULTURE,
Washington, D. C.

SAN ANTONIO, TEX., *June* 28, 1868.

DEAR SIR.—I hand you with this letter a bag containing a quantity of dried bulbous roots of the plant canaigre. The chemist, F. Kaltyre, of this city, says that these roots contain 32 per cent. of tannic acid in its natural state (dried), while the imported extract catechu of commerce has only about 40 per cent. of tannic acid This root has no gallic acid in it, which is very objectionable as a tanning agent.

Mr. Kaltyre did not analyze it with a view of ascertaining the presence of other foreign matter particularly, but only to ascertain the exact proportion of tannic acid, which he pronounced more powerful than any other known agent in its natural state Will you please forward this root, and have determined if the plant be as valuable as represented? It can be cultivated very cheaply in this climate. It is a native of Texas.

Yours, very respectfully,
JOHN JAMES.

S. P. GAMBIA, Esq.

A letter similar to the above was, by Mr. Gambia, addressed to Professor Joseph Henry, of the Smithsonian Institution, together with a letter from Mr. James similar to the above, and accompanying these letters a second parcel of the roots was also sent, which parcel, together with the letters above referred to, were submitted to the Department of Agriculture by Professor Henry, with the following indorsement:

Respectfully referred to the Agricultural Department, with the specimens (in one small bag).

JOSEPH HENRY, Secretary.

Since the letter to Professor Henry differs in some particulars from the statements above given, the letter is reproduced :

San Antonio, Tex., *July 15, 1886.*

Sir : It is now some days since I forwarded by mail a package of 64 ounces of the dried roots of the canaigre plant, used to some extent by the Mexicans in tanning hides. I addressed the package to the " Smithsonian Institute, Washington, D. C."

These roots were found in the vicinity of San Elizario, county of El Paso, Texas, where they grow abundantly without cultivation. They were also seen growing on the banks of the Lympia, a stream in the vicinity of Fort Davis, Western Texas. I enclose for your perusal a copy of a letter I received from John James, Esq., of this city, at whose instance I forwarded the package of canaigre roots. He wishes to have the roots fairly tested by some of your Washington chemists, and a report made if they are found to be of value, as it may save us the necessity of sending hides north to be tanned, if these roots can be used instead of the barks in use at the north for tanning leather. Vast quantities of hides are shipped annually to the north to be tanned that possibly may hereafter be tanned here, as the roots of the canaigre plant can be raised to any extent in Western Texas, where the beeves are killed.

At San Elizario a Mexican was found tanning skins with the canaigre root, and I am informed that in the interior of Mexico the primitive settlers are in the habit of using this root in dressing hides. I suppose the canaigre root can be grown at an expense of about one cent a pound in North-western Texas, and transported to the sea-coast at say two dollars the hundred pounds. Very respectfully yours, &c.,

Hon. Joseph Henry, S. P. GAMBIA, *Postmaster.*
Secretary Smithsonian Institution, Washington, D. C.

An examination of these specimens, now over eleven years old, confirmed the great value of this new source of tannin, as will appear in the chemical analysis. Correspondence was entered into with those in the vicinity referred to, and a quantity of the fresh roots obtained, some of which were subjected to analysis, and the remainder were planted with a view of developing the plant and determining its botanical relations.

After a thorough examination of these specimens of cañaigre had confirmed the great value of this new source of tannin as will appear in the analysis given, effort was made to obtain some of the green root in a fresh state, but as there were no funds available which could be used to pay the expenses of an agent to examine this subject thoroughly upon the ground, and hunt up the botanical history of the plant upon its native soil, there was nothing left for the department to do but to correspond and endeavour to obtain such information as possible through correspondence with persons living in the vicinity where it was said to grow. As this region is unsettled and in an almost wild portion of Northwestern Texas, in which the department had no regular correspondents, it was not until after some months that we were able to obtain by mail a small package of the green roots and an imperfect history of its growth. Some of these roots were subjected to an analysis, and the results fully confirmed the former examination made with the dried material. The remainder was planted with the view of developing the foliage of the plant, and determining its botanical relation. It proved to be a Rumex, but the exact determination requires further development than we have been able as yet to obtain from the plants grown in our propagating beds.

Such efforts will be continued as are possible with the limited means at the command of the department to obtain enough specimens of the seed of this remarkable plant to make a fair experiment in its cultivation and utilization, to the analysis of which the particular attention of those to whom this subject will prove of especial interest is called. In furtherance of an increased acquaintance with the tannin-producing plants of the world which may probably be grown with success in our own country, an interesting article upon the cultivation of the "wattle" for its bark, which is the chief source of tannin in Australia, has been prepared, and is published in this report as additional information upon this important subject.

WILLIAM G. LE DUC,
Commissioner of Agriculture.

EXAMINATIONS FOR TANNIC ACID—ANALYSIS OF CANAIGRE ROOT.—The sample was taken from roots received by this department, in 1868, from Northwestern Texas. The roots are from 4 to 6 or 8 inches long by about 1 inch in diameter, deeply corrugated, of a dark-brown color externally, a deep red-brown color internally, and of a peculiar odor like madder. In fine powder it is of a light red-brown color.

The fresh roots received from the same locality were smooth in outline, and much resembled sweet-potatoes in form, but were dark-brown in color. In transverse section they were of a bright lemon-yellow color, which rapidly changed to red-brown by exposure to the air. They lost water very rapidly, becoming shrivelled like the roots previously received.

Both the fresh and the dry roots have a very astringent taste. In the fresh root, containing 68.07 per cent. of moisture, the tannin equalled 8.51 per cent., or 26.62 per cent. when calculated to water-free substance.

The air-dry roots, containing 11.17 per cent. of moisture, contain 23.45 per cent. of tannic acid, equivalent to 26.30 per cent. of tannin in strictly dry root. From the close agreement in the tannin estimations in the fresh and dry roots it would seem as if the tannin was not affected by long keeping.

This tannic acid is of the variety known as rheo-tannic acid, and is identical with that existing in rhubarb. In many respects canaigre root resembled rhubarb, and the following analysis has been made with a view to determine, if possible, the value of canaigre root either as a tanning material or as a medicinal substance.

The following are the percentages extracted by solvents from the air-dry root, which contained 11.17 per cent. of moisture:

Cold water	41.48
Alcohol, 98 per cent.	44.01
Alcohol, 85 per cent.	48.19
Petroleum ether	.90
Chloroform	.92
Carbon disulphide	.96

Ether extracts varying amounts according to the time it is allowed to act. It will be observed that petroleum ether, chloroform, and carbon disulphide extract nearly the same amounts. The extract thus obtained was a yellow soft-solid substance, freely soluble in alcohol, ether, benzole, carbon disulphide, and chloroform; insoluble in water. Its solutions have a faintly acid reaction. It is soluble, in greater part, in alkaline hydrates, with a beautiful pink to carmine color. Its faintly alkaline ammoniacal solution precipitates acetate of lead pink, and reduces potassium permanganate in the cold, and apparently reduces silver nitrate. This substance has been called *yellow resin* in this analysis, although it may contain traces of oil, chrysophanic acid, and emodin (Quar. Jour. Ch. Soc. x, 300). Alcohol extracts the above *yellow resin* and a red-brown substance in some particulars resembling the *erythroretin* of Schlossberger and Döpping (Ann. Ch. Phar. *l*, 219).

This substance, when dried, is a brittle red-brown solid, not fusible on the water-bath, soluble in alcohol and diluted alcohol, insoluble in water and nearly insoluble in ether, chloroform, benzole, petroleum ether, carbon disulphide. With alkaline hydrates it dissolves to a beautiful purplish-red solution; excess of acid re-precipitates the substance. Alcohol also extracts the rheo-tannic acid already mentioned, together with some sugar and a red substance soluble in water.

Water extracts this red coloring matter, a brownish coloring matter insoluble in alcohol, ether, etc., together with gum, pectin, and sugar.

Dilute potassium hydrate, used after the substance had been thoroughly extracted by alcohol and water, was colored dark purplish red. When acidified, the solution precipitated flocks of a deep red-brown substance, much resembling the red substance extracted by alcohol, but differing from it in being insoluble in alcohol.

In all these particulars this substance exactly corresponds with *aporetin*, and, accordingly, it has been so designated in this analysis.

The root contained considerable starch; the starch grains were medium-sized, round and ovate. The starch was converted into glucose by dilute sulphuric acid, and estimated from the glucose formed.

Albuminoids were calculated from the total nitrogen, by combustion with soda-lime.

Cellulose was determined in the residue after the extraction of all the above-named substances.

Moisture was determined from loss of weight at 110° to 120° C; ash, by simple combustion.

The figures given are for ash-free substances, and direct estimations were made in every case, except for sugar and "red substance soluble in water." Oxalic and malic acids were not estimated.

Analysis of Canaigre.

Emodin?	Trace	Soluble in alcohol.
Yellow resin	.93	
Red substance, soluble in alcohol	10.48	
Red substance, soluble in water Sugar	10.44	Soluble in water.
Rheo-tannic acid	23.45	
Gum, pectin, brown color	6.41	
Albuminoids	5.21	
Aporetin	4.78	
Starch	18.00	
Cellulose	4.52	
Ash	4.38	
Moisture	11.17	
	99.77	

Whether this root is valuable either for tanning purposes or for medicinal use must be determined by actual experimentation. The result of the analysis fails to show the presence of any substances that would prove injurious to leather, and the large proportion of tannic acid is certainly a favourable indication. In many particulars this root resembles rhubarb, and it seems probable that it may be used to advantage in place of rhubarb, where a more astringent medicine is indicated.

The rapid change of the fresh root from yellow to brown may be due to the change of yellow resin into the less soluble red-brown substances.

EXAMINATION OF DOCKS FOR TANNIN.—An examination of two species of our native docks, allied to the canaigre, was also made, with the following results :

Rumex crispa :

Tannin in fresh root	2.47 per cent.
Tannin in dry root	5.54 per cent.

Rumex obtusiloba :

Tannin in fresh root	Traces.

A specimen of sumac (*Rhus glabra*) was received from Robert Horning, Onawa, Iowa, which was found to contain as follows :

Sumac (***Rhus glabra***) :

Tannin in fresh leaves	15.50 per cent.
Tannin in dry leaves	16.87 per cent.

TORMENTILLA (*Potentilla Tormentilla*).—Growing in the Faroe and Hebrides Islands—was formerly employed for tanning. Loudon states that in the isles of Tiree and Coll so much land was destroyed in digging for the roots, that the inhabitants were prohibited the use of them. Müller gives the percentage of tannin as 31.25. The leather manufactured with it is reputed to have been very superior.

MARSH ROSEMARY (*Statice Coriaria*), growing abundantly in the south of Russia, has been for centuries employed by the Kalmucks for tanning. It is also similarly employed in the Spanish tanneries. The root is deeply embedded in the earth ; sometimes it is 3 yards in length, with a thickness of from 1 to 5 inches. According to Hammer's process, the root yields 20.25 per cent. of tannin ; with Lowenthal's method of analysis, 24 per cent. In Russia it appears never to be used alone, but always in conjunction with willow bark.

EXTRACTS.

EXTRACTS OF HEMLOCK, CHESTNUT, OAK BARK, AND WOOD.— In writing of these different extracts, I must group them together, as I am only able to give the approximate *values*. Before 1830, as I have previously stated, the extracts of Mimosa Bark from Australia had been introduced to the notice of English tanners, but only one consignment appears to have been received; but in the year 1880 the import of extracts into Great Britain assumed colossal dimensions. The Board of Trade returns will speak for themselves, and I wish that the details of other tanning materials could be as satisfactorily analysed.

Imports of extracts of bark for tanning purposes :—

Chestnut and Oak Bark, &c.	Holland	£516,578	value.
	Belgium	12,796	,,
	France	92,651	,,
	Other Countries ...	13,769	,,
Hemlock	United States	30,187	,,
	Canada, &c.	16,315	,,
		£682,296	

I wish to draw the attention of my readers to this rather startling fact, that they may look at it in all its bearings. If I reckon the value of tanning materials imported at £1,250,000 roughly, then take from that amount the cost of the Gambier imported—namely, about £500,000—it will be apparent that the value of the extracts alone is nearly equal to all our other crude materials reckoned together, the latter amounting to £750,000, and the extracts to £682,299. This, I say again, is a fact not to be passed over without notice, as I am quite sure this disproportion will still more largely increase. The tendency in the future will be to import the majority of our tanning materials in the form of extracts, thereby saving expense of freight, &c. This being the case, the tanner will naturally enquire what security or guarantee he can have that the extracts sold to him are really what they are represented to be. The number and variety of different extracts offered to the Trade are increasing rapidly. Extracts of all colours and consistency are to be met with everywhere, and I am assured that their number will be increased indefinitely. Tanning materials in this form offer to *dishonest* exporters in foreign parts a strong temptation to enrich themselves at the expense of the tanner. Tanning Extracts are sometimes met with strongly impregnated with Glauber salts, and others with foreign matter, such as resin and acetic acid and glucose. It is said in the defence of such extracts, that other things besides tannic acid go to make leather; that may be true, but the tanner would prefer purchasing the pure extract, and mixing the other ingredients afterward if he found it necessary to do so. I have no wish to raise any suspicion as to the probity or integrity of the majority of the firms who now so largely supply these materials, but rather to caution my readers in their purchases to deal direct with respectable firms who themselves import the extracts. If the trade to any extent passes into the hands of middle-men, the tanner will surely have to suffer for it. The British public have had to pay smartly for their beef and mutton, which have had to pass through the hands of middle-men. The grazier tells us that he barely gains a livelihood, while the go-betweens get all the profit. I trust the tanning trade will be warned beforehand. It may be true that many things go to make leather, but tannic acid is the one substance which is known to unite chemically with the *gelatine* of the hide to form *leather*; the tanner must therefore endeavour to obtain it in as pure a form as possible. Experience has taught him how to judge of the value of his Valonia, Bark, Myrobalans, &c., by the cleavage, taste, and colour of the different materials; but with extracts, even the barkrometer is no safe guide, and he will have to seek the aid of the chemist to show the amount of the gelatine which the tannin in the extract will precipitate. I know of no other safe and reliable test. I trust this brief summary of the progress made in the use of extracts during the last fifty years will not be without benefit to my readers.

GAMBIER, or *Terra Japonica* (*Uncaria Gambir*), is obtained principally from Malacca, the port of Rhio, on the Island Buntang, about 30 miles from Singapore, its principal place of export. The planters grow it in connection with Pepper, as the refuse of the Gambier makes an excellent manure for the Pepper plant. Gambier is in the form of blocks or cubes, of a light brown colour. The extract in many cases resembles a red earth, and, as imported to England in its rough state, is very much adulterated, sticks, stones, and large quantities of elephants' dung being mixed with it in the manufacture. If this variety of tannin could be obtained with greater purity, it would fetch a higher price in English commerce, from its greater value to the tanner. The extract is obtained by boiling the leaves, small branches, and pieces of wood of the tree in water, evaporating the liquid to an extract. With the better kind of extract, which goes technically by the name of "Cube Gambier," more care is taken in the preparation, and in order to ensure consistency, starch is mixed with it, or some kind of farina, to consolidate it, and dry it more easily. It is cut into the form of cubes about an inch-and-a-half square before drying. The variety of Gambier which is called the "Block," ranges in value from £15 to £20 per ton, and the best cube from £25 to £35 per ton. The import in 1880 was 25,964 tons; and in 1881, 25,725 tons. This tanners' material is not only used by tanners, but in a variety of different manufactures in England, and is used by dyers and brewers to add to other extracts.

The gambier plant is a stout, climbing plant, a native of the countries bordering on the Straits of Malacca, and especially of the numerous islands at their eastern end. There would appear to be two species employed:—(1) The *Uncaria Gambir*, Roxb.; the *Nauclea Gambir* of Hunter. (2) *Uncaria acida*, Hunt. The cultivation and manufacture seem to have been commenced at Singapore in 1819, and it rapidly extended, until there were about 600 or 800 plantations; but, owing to a scarcity of fuel, without an abundant supply of which manufacture is impossible, and labour becoming also dear, they were reduced to about 400 in 1850, and in 1866 the cultivation was fast disappearing on the island. Of late years, owing to an increased demand for the product, and higher prices ruling, it has rapidly recovered. The first shipments from Singapore were 3,234 cwts. in 1830: in 1834, 2,322 cwts. were sent to England, the price being more moderate, and its use becoming better understood, an active demand arose, which has since contiuued. The culture is also largely pursued on the mainland, where, in 1851, there were 200 plantations. In the islands of the Rhio Linga Archipelago, lying south-east of Singapore, and on the island of Bintang, the most northerly of the group, there were, in 1854, 1,250 gambier plantations. In the three years ending 1870, there was imported, chiefly from Rhio, into Singapore an average of 240,000 cwt. of gambier. The total exports from Singapore in 1870 were 34,550 tons, and in 1871, 34,248 tons, of which 19,550 were received from Rhio and the Malay Peninsula. In 1872, 190,600 piculs were made in Rhio. The plant is propagated either by seeds or cuttings, but the latter are preferred. At the expiration of fourteen months the first cutting of the branches, with the leaves on, is made. The plantations are often formed in clearings of the jungle, where they last for a few years, and are then abandoned, owing to the impoverishment of the soil and the irrepressible growth of the "lalang" grass (*Imperata Koenigii*, Beauv.), which is more difficult to eradicate than even primeval jungle. It has been found profitable to combine with the cultivation of gambier that of pepper, for which the boiled leaves of the gambier form an excellent manure. The gambier plants are allowed to grow from 8 to 10 feet high, and as their foliage is always in season, each plant is stripped three or four times in the year. The apparatus and all that belongs to the manufacture of the extract are of the most primitive description. A shallow cast-iron pan, about 3 feet across, is built into an earthen fireplace. Water is poured into the pan, a fire is kindled, and the leaves and young shoots, freshly plucked, are scattered in and boiled for about an hour. At the end of this time they are thrown into a capacious steeping trough, the lower end of which projects into the pan, and squeezed with the hand so that the absorbed liquor may run back into the boiler. The decoction is then evaporated to the consistency of a syrup, and baled out into buckets. When sufficiently cool, it is subjected to a curious treatment. Instead of simply stirring it round, the workman pushes a stick of soft wood in a sloping direction into every bucket, and placing two such buckets before him, he works a stick up and down in each. The liquor thickens round the stick, and the thickened portion being constantly rubbed off, while at the same time the whole is in motion, it gradually sets into a mass, a result which the workman affirms would never be produced by simply stirring round. Though we are not prepared to concur in the workman's opinion, it is reasonable to suppose that his manner of treating the liquor favours the crystallization of the substance in a more concrete form than it might otherwise assume. The thickened mass, which is said by another writer to resemble soft, yellowish clay, is now placed in shallow, square boxes, and when somewhat hardened, is cut into cubes and dried in the shade. The leaves are boiled a second time, and finally washed in water, which water is saved for another operation. A plantation with five or six labourers contains on an average 70,000 to 80,000 shrubs, and yields from 50 to 60 lbs. of gambier daily. ('Pharmacographia.')

The following have been the imports of gambier into the United Kingdom:

	Tons.		Tons.
1866	12,845	1872	21,155
1867	13,237	1873	22,514
1868	20.239	1874	16,728
1869	16,267	1875	23,299
1870	19,050	1876	21,721
1871	25,175		

KINO, GUM KINO (*Pterocarpus Marsupium* and *Drepanocarpus senegalensis*), is imported from the East Indies, Australia, and Madagascar. It contains 75 per cent. of tannin, being one of the richest agents with which we are as yet acquainted. Its great price has prevented its use in tanning, so that it is at present principally employed for medicinal purposes.

HEMLOCK EXTRACT (*Abies*). The hemlock spruce fir, an evergreen, rising to the height of 70 to 80 feet, abounds in the United States and Canada, and is said to form three-fourths of the woods of the Northern States. The bark is commonly employed by the tanners in their several localities. Within the last fifteen years an inspissated extract has been prepared in Canada, which is shipped to our market in large and increasing quantities. It arrives here in casks, about the consistency of treacle, of a dark red-brown colour by transmitted light. Messrs. J. & J. Miller & Co., of Upton in Canada, took out a patent for the preparation of hemlock extract in 1864, and up to the present time are the principal shippers of it to our shores. Although great prejudice existed against it because of its colour, and the large amount of resinous matter held in solution, yet the trade has increased; and the manufacture is said to be carried to a greater perfection, the import for 1875 being about 6000 tons. The extract is insoluble in cold water, but dissolves readily at a temperature of 150° Fahr. Like many other novelties in the trade, when introduced it was employed too exclusively, giving a bad colour to the leather; it is now, however, used as a useful adjunct to other materials. According to Ramspacher, it gives 25 per cent. of tannin.

CHESTNUT EXTRACT (*Castanea vesca*) is quite a recent importation. It is much more liquid than hemlock extract, and of a dark colour; it contains 18.5 per cent. of tannin. Quantities of the bark of this tree chipped off the hop poles in Kent and Surrey are annually wasted, which might profitably be made into tanning extract.

TANNIN-YIELDING MATERIALS.

The following Table gives the common names of the principal tannin-yielding substances used in commerce, together with the botanical names of the plants producing them the parts of the plant used, and the usual per-centage of tannin contained in good specimens of each material:—

Common Name of Material.	Botanical Name of Plant.	Part of Plant Used.	Average per cent. of Tannin.
Oak bark	Quercus pedunculata and Q. robur	Bark	8—13
Cork bark	Quercus Suber	Inner bark	10—14
Valonia	Quercus Æegilops	Acorn-cups	25—35
Chestnut oak extract	Quercus (an American species)	Extract from bark	20—25
Hemlock bark	Abies Canadensis	Bark	10—12
Do. extract	Abies Canadensis	Extract from bark	18—25
Churco bark	Oxalis gigantea (Chili) ?	Bark	26
Monesia bark	Chrysophyllum glycyphlœum	Bark	32
Mangrove bark	Rhizophora Mangle	Bark	22—33
Alder bark	Alnus glutinosa	Bark	16
Larch bark	Abies Larix	Bark	6—8
Mimosa (Wattle)	Acacia dealbata and A. mollissima	Bark	24—30
Catechu (Cutch)	Acacia and Areca catechu	Extract from wood	45—55
Gambier	Uncaria Gambir	Extract from leaves and small branches	36—40
Terra japonica	Butea frondosa	Do. do.	42—50
Sumach	Rhus Coriaria and R. Cotinus	Leaves	14—18
Chestnut wood	Castanea vesca	Wood	8—10
Do. extract	Castanea vesca	Extract from wood	14—20
Red Quebracho wd.	Loxopterygium Lorentzii	Wood	14—16
Marsh Rosemary	Statice Coriaria	Root	20—24
Rhatany	Krameria triandra	Root	38—42
Myrobalans	Terminalia Chebula and T. Belerica	Fruit	20—40
Divi-divi	Cæsalpina Coriaria	Pod	50—56
Kino	Pterocarpus Marsupium, and Drepanocarpus senegalensis	Extract from fruit	75
Gall-nuts	Quercus infectoria, &c.	Galls	65—77
Tamarisk galls	Tamarix Indica, and T. Africana	Galls	50—54
Eove	? (Greece and Asia Minor)	Galls	24—34

Substances.	Per-centage of tannin.	Authority.
Old oak, white inner bark	21.0	Cadet de Gassincourt.
Do.	14.2	Davy.
Young oak, white inner bark	15.2	Do.
Young oak, colored or middle bark	4.0	Do.
Young oak, entire bark	6.0	Davy and Geiger.
Young oak, spring-cut bark	22.0	Do.
Oak kermes, bark of root	8.9	Do.
Bark of red oak (*Quercus rubra*) from Canton, Ill.	5.55	William W. McMurtrie. Depmt. of Agricult., 1876.
Bark of white oak (*Quercus alba*) from Canton, Ill.	7.85	Do.
Bark of *Quercus coccinea* from Canton, Ill.	7.78	Do.
Bark of *Quercus macrocarpa* from Canton, Ill.	7.85	Do.
Bark of hemlock (*Abies canadensis*) from Van Ettenville, N.Y.	9.5	Do.
Bark of hemlock	13.92	Mulligan and Downing.
Crushed Quercitron bark (*Quercus niger*) from Winchester, Va.	6.47	William W. McMurtrie.
Cutch	47.7	Cooper.
Catechu, Bombay	55.0	Davy.
Catechu, Bengal	44.0	Do.

Substances.	Per-centage of tannin.	Authority.
Catechu, Bombay, light color	26.32	Mulligan.
Catechu, Pegu, dark brown color	46.88	Do.
Gambier or terra japonica	44.88	Esenbeik.
Galls, Aleppo	65.88	Guibourt.
Galls, Chinese	69.0	Bley.
Galls, Istrian	24.0	Roder.
Myrobalans	20.91	Mulligan and Downing.
Sumac from Sicily	16.20	Davy.
Sumac from Carolina	5.0	Cadet de Gassincourt.
Sumac from Virginia	10.0	Do.
Do.	19.35	G. Muller.
Sumac from Palermo	24.37	Mulligan and Downing.
Sumac, ground, from Winchester, Va. (mixed)	24.18	William W. McMurtrie.
Sumac (*Rhus Cotinus*) Hallsborough, Va. ...	24.08	Do.
Sumac (*Rhus glabra*) Georgetown, D.C.... ...	26.1	Do.
Valonia from Smyrna	34.78	Mulligan and Downing.
Divi-divi	29.80	Do.
Do.	49.25	G. Muller.
Mimosa bark...	17.87	Mulligan and Downing.
Do.	31.16	G. Muller.
Wattle bark (*Acacia pycnantha*) golden or broad leaf	45.0	Bosisto, of board of inquiry appointed by council of colony of Victoria, Australia.
Wattle bark (*Acacia decurrens*) black or feather leaf	40.0	
Do.	34.0	
Do.	34.0	
Do.	29.0	

The following figures, taken from the American Cyclopædia, showing the per-centage of tannin contained in most of the substances mentioned below, cover only the variations found in excellent samples of the same material. The characteristics of each are also given:—

Trade Name.	Percentage of tannin.	Characteristics.
Terra japonica	42 to 50	Color bad; makes little weight; leather soft and open.
Sumac	24 to 33	Color light; gives some firmness; makes leather soft and pliable.
Myrobalans ...	28 to 44	Color yellow; makes little weight; leather mellow.
Oak bark ...	11 to 13	Nearly colorless; gives good weight; makes leather very firm and solid.
Hemlock bark	11 to 13	Color red; gives good weight; makes leather firm and hard.
Valonia	34 to 40	Color fair; gives weight; makes leather hard.
Divi-divi... ...	26 to 50	Color poor; gives great weight.
Mimosa bark...	24 to 36	Color very red; gives weight; makes leather hard and brittle.

It will be seen that analyses made of these substances by distinguished chemists vary widely in their results. For this reason, the tables given cannot be depended upon. Intelligent tanners are not, however, guided in their selection of tanning materials by the absolute percentage of tannin alone, but follow rules based on their own experience. The color, general appearance, solidity, pliability, and many other conditions which constitute good leather must be taken into consideration. These depend upon other things than the mere amount of tannin contained in the barks or other substances which are employed, and have, of course, a corresponding influence upon their price.

In the United States and England oak-tanned leather is regarded by many as the best. In this country it always brings a higher price than hemlock-tanned leather, not only because it is supposed to be more durable, but because of its light color. The coloring matter and resin contained in the hemlock have a tendency to make the leather harder and more brittle, and also to make it of a dark reddish hue that is not liked so well as the bright light appearance of that tanned with oak. Another reason for the greater popularity of the oak-tanned leather is that both in the United States and England all supplies for government use are required to be of this tannage.

Cutch is extracted from the acacia catechu, a tree which grows to the height of twenty or thirty feet on the coast of Malabar. The heart and bark of the wood are boiled in water and the solution evaporated.

The results obtained by tanning with valonia are almost, if not fully, the same as when the best qualities of bark are employed. It makes hard, firm leather, harder and less permeable to water than that made with oak bark, and also presents the advantage of readily depositing a rich bloom upon the leather.

The following table shows the quantities and values of the different tanning materials imported into England during the year 1877:

Articles.	Quantities.	Value.
	Tons.	
Bark (for tanners' and dyers' use) ...	32,283	£282,926
Bark extracts	—	105,317
Cutch	6,664	164,583
Gambier	25,354	539,322
Myrobalans	15,725	203,042
Sumac	13,409	224,862
Valonia	29,989	668,497
Total ...	123,424	2,188,549

In France, in 1875, there were imported 32,261 tons tanning materials of a total value of 10,514,569 francs. Of these, 21,419 tons, worth 4,554,569 francs, were barks for tanners' and dyers' use.

The supplies of bark imported into England and France in the years mentioned were obtained from Algeria, Australia, Austria, Belgium, Germany, Holland, Italy, Norway, Spain, the United States, and other countries.

In 1878 the importations of tanning materials into the United States were:

Articles.	Tons.	Value.
Barks for tanning	—	$412,575
Hemlock extract	—	24,214
Cutch, Gambier, &c.	11,049	978,539
Total ...	11,049	$1,415,328

The exports of the same materials from the United States for the same year were of bark of various kinds amounting in value to 111,335 dollars.

The following Table gives the tannin-yielding materials used, classified according to the part of the world in which they are used:—

Vernacular Name.	Scientific Name.	Part of Tree Used.	Remarks.
British Isles.			
Oak	Quercus pedunculata	Bark	
	Do. Robur	Do.	
Larch	Larix europæa	Do.	
Alder	Alnus glutinosa	Do.	
Tormentil	Potentilla Tormentilla	Root	
France.			
Kermes	Quercus coccifera	Bark	
Dentelarie	Plumbago europæa	Bark of root	
Willow	Salix alba	Bark	
Do.	Do. cinerea	Do.	
Sumach	Rhus Coriaria	Leaves	
Spain.			
Cork tree	Quercus Suber	Bark	Inner bark
Chestnut	Castanea vesca	Bark & exct.	
Alder	Alnus glutinosa	Bark	
Aleppo pine	Pinus aleppensis	Do.	
Stone pine	Do. Pinea	Do.	
Italy.			
Cork tree	Quercus Suber	Bark	Sardinia
Holm, or ever-green oak	Do. Ilex	Do.	Tuscany
Sumach	Rhus Coriaria	Leaves	Sicily
Olive	Olea europæa	Bark	
Myrtle	Rhus myrtifolia	Do.	
Knoppern	Quercus pubescens	Galls	Also Hungary
Turkey.			
Valonia	Quercus Ægilops	Acorn cup	Smyrna
Galls	Do. infectoria		
Russia.			
Birch	Betula alba	Bark	
Marsh Rosemary	Statice Coriaria	Root	(See Bernardin,
Bearberry	Arctostaphylos Uva-ursi	Leaves	[Exp. v. p. 24).
British Guiana and West Indies.			
Mess apple bark	Blakea quinquenervia	Bark	
Mora	Mora excelsa	Do.	Tannin 8.28 p.c.
Seaside grape	Coccoloba uvifera	Do.	
Kakaralli	Lecythis ollaria	Do.	Do. 7.72 p.c.
Cuyama		Do.	
Kullaballi		Do.	
Arrasa		Do.	
Do.	Bucida buceras	Do.	
Hog plum	Spondias lutea	Do.	
Yellow Silverballi	Nectandra spec.	Do.	
Baramalli, or pump wood		Do.	
Courida	Avicennia nitida	Do.	
Divi divi	Cæsalpinia Coriaria	Seed pod.	
Blood wood		Bark	Do. 0.16 p.c.
Crab wood	Carapa guianensis	Do.	Do. 1.12 p.c.
Comacoballi		Do.	
Dankuma		Do.	Do. 11.32 p.c.

Nevertheless, after analyses made by distinguished chemists, it has been found possible to arrive approximately at the quantities of tannic acid contained in the substances commonly used in tanning. However, these tests always involve much loss of time and great expense.

When a tanner is about to make a purchase of bark or extract, he requires to have ready to his hand an instrument which enables him promptly and easily to test the samples. To await the result of a chemical analysis is often very difficult, and always takes too much time.

The process of Professor Muntz consists in testing the tannic matter by observing its absorption by the raw skin, and is based upon the principle of tanning itself; it is an *unerring test,* which in a very short time (about twenty minutes) shows the quantity of tannic matter which the skin retains.

Public experiments have been made at the Conservatoire des Arts et Metiers in Paris, and have given results which, proved by chemical analysis, were found very conclusive and in favour of our portable machine.

Large tanners and Professors of Chemistry in England, have tested this machine, and have decided that it is a *most accurate test* for tanning substances and extracts.

The advantages of this apparatus are its extreme simplicity, and that it can be manipulated by an ordinary workman. It obviates the use of chemicals, which cannot be safely relied on as a test.

DIRECTIONS FOR USE.

For Bark, select half-a-pound of the tanning material, to represent the average; this grind in coffee mill; then weigh of the powder from 2½ to 20 grammes [see * next page]. Place the weighed powder in clean Florence oil flask, adding to it $100^{cc.}$ of cold water; this to be well mixed, and allowed to stand a few hours. The contents in flask to be boiled for five minutes (this can be effected over Bunsen's burner, or the flask immersed in small saucepan of boiling water). The solution to be filtered through filtering paper. Temperature of liquor brought to 60° Fahrenheit. The density of liquor to be taken with small tannometer, note being made of the same.

Take a piece of thinnish hide, which has been unhaired and fleshed; this should be free of lime. Squeeze out all superfluous water, place the piece of hide (flesh uppermost) on the base of machine, put on the cover, close up side-claws and screw them down; pour in the liquid through side-opening, placing in securely the screw stopper; put on pressure by turning the screw, the liquid will be forced through the skin drop by drop into glass below. When sufficient has been collected, the liquid must be